

# Cypermethrin toxicosis on protein metabolic profiles in *Rana hexadactyla*

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## SUMMARY

Cypermethrin is a synthetic pyrethroid insecticide with low mammalian toxicity but high insecticidal activity. Frogs, *Rana hexadactyla* were exposed to sublethal concentration (i.e., 1/10 LC<sub>50</sub> 1.63mg/l) of cypermethrin for 7 days and 30 days to analyze various protein metabolic profiles in different tissues. Total proteins showed decrement, whereas free amino acids and the activity of protease, aspartate aminotransferase, alanine aminotransferase and glutamate dehydrogenase as well as ammonia and urea significantly increased in cypermethrin-exposed frogs. It was also observed that alterations steadily increased with the days of exposure and exhibited tissue specificity. These effects on the protein metabolism of frogs exposed to cypermethrin, which cause impairment on protein synthetic machinery, indicate its toxic effects on cellular functioning.

Pesticides are unique contaminants in that they are intentionally released into the environment to elicit toxicity in certain 'pest' species. Unfortunately, lack of selectivity often leads to problems in humans and other non-target species.

An increase in global food demand has resulted in a significant increase in the use of pesticides in agriculture. This has caused great concern among health and environmental scientists, since some of these chemicals induce mutations (somatic as well as germ-line) in experimental systems (Meng *et al.*, 2000). In humans, exposure to pesticides has been associated with cancer (Dich *et al.*, 1997).

Synthetic pyrethroid pesticides account for over 30% of the global pesticide use (Eisler, 1992). Two distinct classes of pyrethroids have been identified based on different behavioral, neuropsychological and biochemical profiles. Type I pyrethroids mainly cause hyper-excitation and fine tremors, while Type II pyrethroids possess a cyano-group and produce a more complex syndrome, including chronic seizures (Verschoyle and Aldridge, 1980). These compounds have gained popularity over organochlorine and organophosphate pesticides due to their high efficacy against target species (Elliot *et al.*, 1978), their relatively low mammalian toxicity (Parker *et al.*, 1984), and rapid biodegradability (Leahey, 1985). Cypermethrin [alpha-cyano-3-phenoxybenzyl ester of 2, 2-dimethyl-3-(2, 2-dichlorovinyl) cyclopropane carboxylic acid], is a composite synthetic pyrethroid, a broad spectrum,

biodegradable insecticide, and a fast-acting neurotoxin with good contact and stomach action. It is used to control many pests, including moths, and pests of cotton, fruit and vegetable crops. Consistent with its lipophilic nature, cypermethrin has been found to accumulate in body fat, skin, liver, kidneys, adrenal glands, ovaries and brain (Hall *et al.*, 1980).

The present study critically examines the magnitude and relationships of the metabolites and enzymes involved in the metabolism of proteins in functionally different tissues of frogs treated with sublethal concentration of cypermethrin.

## MATERIALS AND METHODS

### *Experimental animals:*

About 30 adult, healthy frogs, *Rana hexadactyla* were collected from their natural habitat, in and around Tirupati with a mean weight of 50±5gm. They were housed in glass tanks partially filled with wet soil and covered with wire mesh. They were acclimated to laboratory conditions for one week prior to the experiment and water temperature 27±2 °C, pH=7±0.1 and light period of 12 h. They are fed with earthworms and cockroaches *ad libitum* to prevent starvation. The animals were starved for 24 h before they were exposed to pesticide. Each frog was examined for signs of abnormality or parasitic infection, if found they were rejected. Technical grade cypermethrin (92% purity; *cis:trans* ratio 40:60) was obtained from Tagros Chemicals India Limited, Chennai. Cypermethrin was

### Key words :

Cypermethrin,  
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